

NASA TECH BRIEF

Goddard Space Flight Center



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Bidirectional Zoom Antenna

In a variable-beamwidth (or zoom) antenna, beamwidth can be widened for low-gain operation or narrowed for high-gain operation by simple switching. In the low-gain mode the wide beamwidth allows the antenna to search a large area in one scan. When a signal is picked up, the antenna is switched into the high-gain mode. The resulting narrow beam increases communications efficiency. Two variable-beamwidth antennas have already been described in NASA Tech Brief B74-10041 (GSC-11760).

Recently a new bidirectional zoom antenna has been developed. It comprises two parabolic cylinders placed orthogonal to each other. One cylinder serves as main reflector, and the other as subreflector. The cylinders have telescoping sections to vary the antenna

beamwidth. The beamwidth can be adjusted in elevation, azimuth, or both. The design has no restriction as to the choice of polarization.

As shown in Figure 1, the main reflector is a parabolic cylinder with focal axis f_1 . Its bottom edge is truncated where the dotted line starts. The dotted line shows an imaginary continuation of the parabola. The subreflector is not truncated and forms a parabolic cylinder orthogonal to the main reflector. Its focal axis f_2 , orthogonal to focal axis f_1 , intersects the top edge of the main reflector. Located at the intersection is a monopulse multibeam feed aimed at the subreflector. The feed rotates as the beamwidth is changed, to maintain the feed position within the Airy disk of the system.

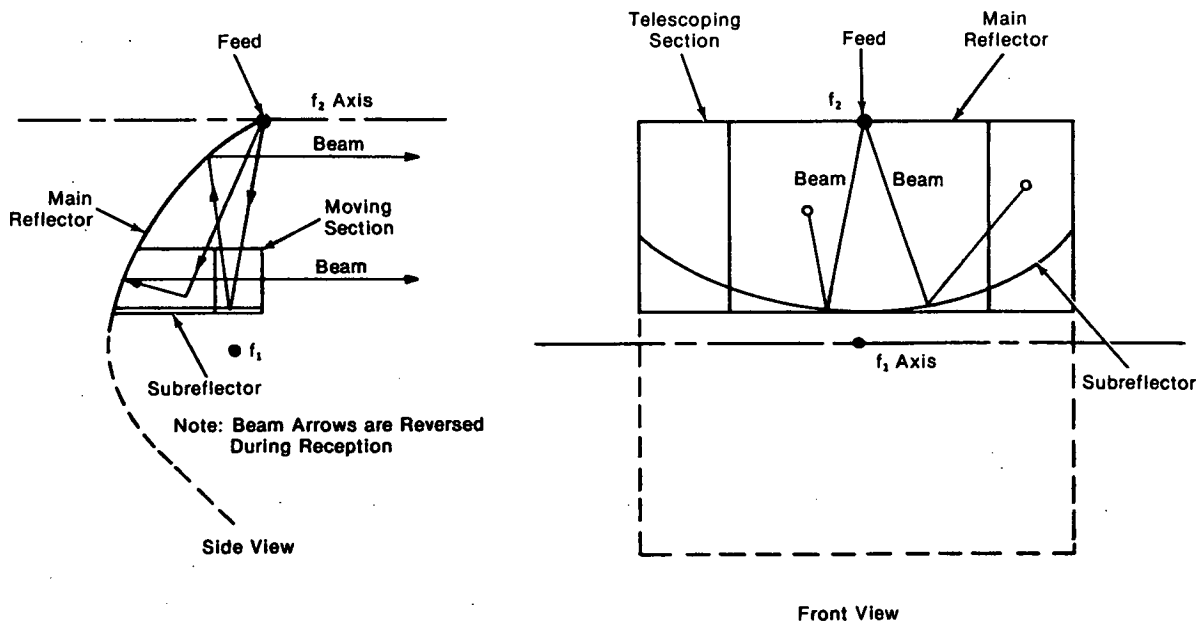


Figure 1. Antenna Configuration in the High-Gain Mode

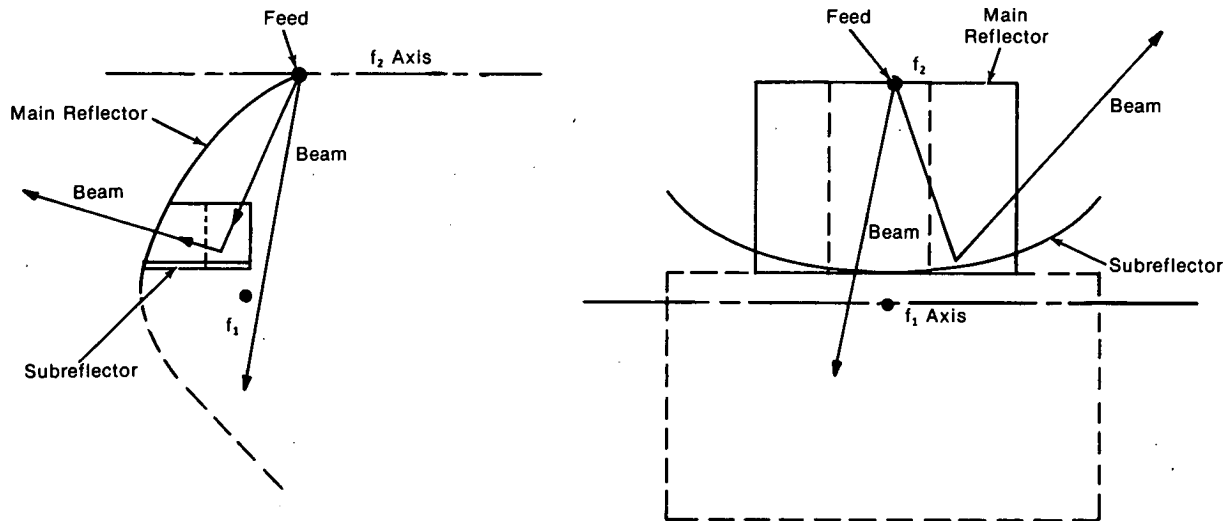


Figure 2. Antenna Configuration in the Low-Gain Mode

The main reflector has telescoping sections on its right and left sides. The subreflector has a single telescoping section to increase or reduce its length. The telescoping sections on the main reflector control azimuth beamwidth, whereas the telescoping section of the subreflector controls elevation beamwidth. The sections are moved by rack-and-pinion mechanisms driven by servos.

In Figure 1 all sections are extended to provide the high-gain mode. The energy from the feed irradiates the subreflector. This energy reflected from the main reflector forms a narrow-beam output.

In the low-gain mode, as illustrated in Figure 2, all sections are retracted. Part of the energy from the feed misses the subreflector and continues in a straight line as spillover. The other part bounces from the subreflector and forms a wide beam. The resulting pattern covers a wide area.

Note:

Requests for further information may be directed to:

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Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

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